

CAPE EXPEDITION—SCIENTIFIC RESULTS OF THE NEW ZEALAND
SUB-ANTARCTIC EXPEDITION, 1941–45

THE TICKS (IXODOIDEA) OF THE NEW ZEALAND SUB-REGION

by
L. J. DUMBLETON



*Issued Under the Authority of the Hon. R. M. Algie,
Minister of Scientific and Industrial Research*

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FOREWORD

THIS SERIES OF REPORTS is based in the main on collections of specimens and data made at the Auckland and Campbell Islands in the years 1941-45. Early in 1941, coast-watching stations were established at Port Ross, Carnley Harbour, and Perseverance Harbour, and the personnel of from three to five men at each were relieved only once a year. Standing instructions issued by Navy Office included a recommendation that the men should, in addition to service routine, record general observations on natural phenomena. In making a selection of suitable volunteers, the Aerodromes Branch of the Works Department was able from 1942 to post at each station at least one man with some professional qualifications in geology or biology. The names of most of them are given below in the list of committee members, but the collections were enriched by the work of many others who made no claim to professional status as naturalists.

In 1944, coast-watching was abandoned and the Auckland Islands stations closed, but in that year special opportunities were given for visits to the Snares and Disappointment Island. The Campbell Island station was continued for routine meteorological reporting and ionosphere research, but, except for the inclusion of a report on Aurorae as number one of this series, all results of this work are published elsewhere. Biological and geological material collected after 1945 has not generally been included, and these reports may be regarded as covering the work of the "Cape Expedition" which was the war-time code name for parties in the field between 1941 and 1945.

Arrangements for the writing of reports and for publication have been dealt with by a committee consisting of Dr. H. H. Allan (Chairman), Dr. J. Marwick, the Directors of Auckland, Dominion, Canterbury, and Otago Museums, and the following field collectors: C. A. Fleming, J. H. Sorensen, W. H. Dawbin, E. G. Turbott, and R. W. Balham. The Committee is indebted to authors who have undertaken to prepare reports, and to Mr. F. R. Callaghan, Secretary of the Department of Scientific and Industrial Research, and to his staff, for arrangements for publication.

R. A. FALLA,

*Hon. Secretary, Cape Expedition
Reports Committee.*

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THE TICKS (IXODOIDEA) OF THE NEW ZEALAND SUB-REGION

By L. J. DUMBLETON*

(Manuscript received by Cape Expedition Committee on 25 September 1950)

INTRODUCTION

THE NEW ZEALAND SUB-REGION is considered here as extending from the Kermadec Islands in the north to Macquarie Island in the south.

The tick fauna (superfamily Ixodoidea) of New Zealand is small, and the species so far known all belong to the family Ixodidae. No Argasid ticks have been recorded from the region although *Argas vespertilionis* and *Ornithodoros capensis* have been recorded from the penguin *Spheniscus demersus* in Cape Colony and *O. capensis* has also been recorded from *Eudyptula minor* in Western Australia.

One introduced tick, *Haemaphysalis bispinosa*, is established and three others, *Haemaphysalis leachi*, *Hyalomma aegyptium*, and *Ixodes ricinus*, have each been recorded once from New Zealand, though it is doubtful if any of them is established.

The native ticks belong to two genera, several species of *Ixodes* occurring on land and sea birds and one species of *Aponomma* occurring on the tuatara (*Sphenodon punctatus*). Two of the native ticks, *Ixodes uriae* and *I. auritulus*, are widely distributed in both hemispheres. In the New Zealand region *I. uriae* tends to be typically Subantarctic and occurs infrequently on the mainland, although three of its hosts, *Eudyptes pachyrhynchus*, *Catharacta lonnbergi*, and *Megadyptes antipodes*, breed in New Zealand proper. *Ixodes auritulus* occurs more commonly in New Zealand where several of its hosts breed, e.g., *Catharacta lonnbergi*, *Pachyptila turtur*, *Pelecanoides urinatrix*, and *Puffinus griseus*. The sooty shearwater (mutton bird) *P. griseus*, which breeds in both New Zealand and the Subantarctic, is said to migrate to the Arctic along the North American coast in the summer, and migrations of this type could furnish an explanation of the bi-polar distribution of *I. uriae* and *I. auritulus*.

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Two of the native species, *Ixodes anatis* and *Aponomma sphenodonti* are endemic and occur only in New Zealand proper or on the small islands close to the coast. *Ixodes eudyptidis* has been recorded outside the New Zealand region on the south-east coast of Australia. It does not appear to occur in the Subantarctic and has never been taken on the Snares, Antipodes, Campbell, or Macquarie islands. Several of its hosts do not breed south of New Zealand proper (e.g., *Eudyptula*), and *I. eudyptidis* has never been taken south of their breeding area. The hosts of *eudyptidis* which do breed to the south (e.g., *Eudyptes*) also breed in New Zealand.

I am much indebted to the Cape Expedition Reports Committee for the opportunity to study the Cape Expedition material, and to the Directors of the Canterbury Museum, Dominion Museum, and Cawthron Institute, for access to tick material in their care.

DESCRIPTIONS OF THE SPECIES

Ixodes anatis Chilton, 1904

The female and nymph of this species were redescribed and figured by Nuttall (1916, pp. 317-20). Descriptions, accompanied by reproductions of Nuttall's figures, are given by Fielding (1926, pp. 44-5) and by Taylor and Murray (1946, pp. 67-8). The male and the larva are here described for the first time.

MALE. (Plate 1, figs. 5-9)

BODY. Oval; length (including capitulum) 3.4 mm., width 2.2 mm.

CAPITULUM. Basis widest, 0.47 mm., immediately behind article 1 of palps, sides strongly converging posteriorly to neck, basis and neck separated dorsally by a straight carina, not separated ventrally. Ventrally there is a short seta on each side of basis behind article 1 of palps. Cornua and auriculae absent. Neck width 0.30 mm., sides sub-parallel or slightly divergent posteriorly. Palpal joints 2 and 3 sub-equal, combined length 0.30 mm. Palps short, clavate, rounded apically, article 4 small, rounded.

HYPOSTOME. Short, stout; length 0.25 mm. slightly swollen apically and slightly emarginate at tip, but not strongly bifid. Dentition variable 2/2 or 3/3, outer file of 6 broad teeth which are twice as wide as the inner teeth; teeth of inner files only present in first three or four rows.

SCUTUM. Length 2.8 mm., width 2.0 mm., smooth, shining, hairless, castaneous. Scapulae small, cervical grooves not strongly developed, lateral carina absent, marginal body-fold narrow.

VENTRAL PLATES. Smooth, shining, castaneous, impunctate except around genital region and between coxae 4 and spiracular plate. Hairless except for scattered short setae on anal and adanal plates. Median plate larger than wide, length 1.6 mm., width 1.3 mm. Anal plate approximately as wide as long, length 0.57 mm., anterior margin straight, lateral and posterior margins rounded, widest at mid length. Pregenital plate between coxae 1 transverse, somewhat crescentic, concave anteriorly and convex posteriorly. Jugular plates absent. Epimeral plates extending anteriorly to coxae 4, separated by unpigmented area from pigmented plate between coxae 2-4 and median plate. A narrow plate on anterior and mesal margins of spiracular plate.

LEGS. Coxae contiguous. No internal spur on coxa 1; definite external spurs on coxae 1-3, small or absent on 4, the spurs more rounded than triangular. Setae not strongly developed or numerous. Posterior gibbosity on trochanters 1 and 2, spurs on 3 and 4. Dorsal spur on trochanter 1. Tarsus 1 humped, length 0.75 mm. Tarsus 4 tapering abruptly, length 0.35 mm.; metatarsus 4, length 0.22 mm.

SPIRACULAR PLATE. Ovoid, long axis longitudinal, macula slightly behind mid length, length 0.45 mm.

GENITAL APERTURE. Between coxae 2.

ANAL LOBES. Three pairs of setae.

Described from a specimen in the Cawthron Institute collection, collected (? by J. G. Myers) with females and one nymph of *I. anatis* from a kiwi (*Apteryx* (?) *mantelli*), Aponga, North Auckland, 18/7/21. Another male, collected with *I. anatis* females, nymph, and larvae, from a kiwi on the Orowhana Range, North Auckland, by H. S. Whitehorn, 1/9/23, is in the Cawthron collection.

FEMALE. (Plate 1, figs. 1-4)

BODY. Gorged specimens up to 10 mm. long, 7 mm. wide.

CAPITULUM. Basis short and broad with straight rounded ridge dividing it from neck, sides with slight rounded cornua posteriorly. Porose areas separated by slightly less than their length. Palps with article 1 large and massive, and article 2 twice as long as 3.

HYPOSTOME. Dentition 3/3 apically, then 2/2, 12 to 14 teeth in outer file.

SCUTUM. Sub-pentagonal, wider than long, length 1.5 mm., width 1.65 mm., lateral and posterior angles broadly rounded.

VENTER. Anal grooves not joining in front of anus but forming two crescentic lines converging in front of and behind anus.

LEGS. Coxa 1 with external spur, coxae 2-4 without spurs. Tronchanter 1 with dorsal spur. Trochanters 1-4 with distal posterior gibbosity or spur. Tarsus 4 short, slightly humped, and tapering abruptly.

SPIRACLE. Long, ovoid, long axis transverse.

N Y M P H

Resembles female. Scutum, length 0.61 mm., width 0.67 mm. Dentition 2/2, with 10 teeth in outer file. Coxa 1 with prominent external spur, coxae 2 and 3 with very small spurs.

L A R V A. (Plate 1, figs. 10-13)

BODY. Sub-circular; length including hypostome 1.5 mm., width 1.2 mm. Body setae present, about same size as in *eudyptidis*.

CAPITULUM. Palpal article 1 transverse, 2 and 3 not separated; combined length 0.13 mm., width 0.05 mm., long and thin, slightly flattened mesally; 4 inserted ventrally on apex of 3, sub-globose. Basis ventrally with 2 para-median sensory pores or short setae.

HYPOSTOME. Spatulate; length 0.13 mm., width 0.05 mm.; dentition 2/2, with about 8 teeth per file.

SCUTUM. Wider than long; length 0.32 mm., width 0.35 mm., widest anteriorly at about $\frac{1}{4}$ length. Four setae on anterior margin behind neck, 2 on each side before lateral angle.

LEGS. Coxae 1-3 with posterior external spurs, coxal setae 3, 2, 2 or 3, 3, 2. Tarsus 1, length 0.25 mm., slightly humped and tapering abruptly. Metatarsus 3, 0.07 mm. long, tarsus 3, 0.16 mm. long.

ANAL LOBES. One seta on each.

Described from specimens with female and nymph of *I. anatis* collected by E. Rye from a kiwi, Tangihua Range, North Auckland, 1949.

The type locality is Ashburton in the South Island. The type and co-type females are in the Canterbury Museum. Female specimens determined by Nuttall and a male determined by the author are in the Cawthron collection. The species occurs only on land birds and not outside New Zealand proper. It is the only species so far known from the kiwi and has been taken more commonly from that host than from the type host, the grey duck.

Maskell (1897) described *Ixodes apteridis* (from *Apteryx mantelli* from forest ranges near Mt Egmont, per W. Buller) and *I. aptericola*

(from *Apteryx australis*, Dusky Sound, per J. Hector). The types of these species cannot be found and the species are not determinable from the descriptions. It is highly probable that both Maskell's species are referable to *I. anatis*. Should this ever be proved, *aptericola* Maskell and *anatis* Chilton will become synonyms of *apteridis* Maskell which has page priority over *aptericola*.

Ixodes auritulus Neumann, 1904

Syn. *I. thoracicus* Neumann, 1899

A description of the female, accompanied by Neumann's figures, was given by Nuttall and Warburton (1911, pp. 187-9). The species was later redescribed and figured by Nuttall (1916, pp. 312-5) who first described the nymph and the larva at that time. The female and nymph are described and figured by Cooley and Kohls (1945, pp. 195-7). The female, nymph, and larva, are described by Taylor and Murray (1946, pp. 42-4) who reproduces Nuttall's figures. The male is here described for the first time.

MALE. (Plate 2, figs. 5-9)

BODY. Oval; length including capitulum 2.5 mm., width 1.7 mm.

CAPITULUM. Basis widest, 0.24 mm., immediately behind the palps, lateral margins convergent posteriorly but not as abruptly as in *anatis*. Ventrally with two pairs of setae on basis behind first palpal article. Cornua absent. Dorsally the basis is separated from the neck by a short carina. Neck with sides slightly divergent posteriorly, a group of 6-8 setae on each side at mid length. Ventrally the basis ends posteriorly in a rounded line separating it from the neck. Auriculae absent. Palpi short, rounded apically; article 1 short, articles 2 and 3 not divided, combined length 0.19 mm.; articles 4 small, rounded.

HYPOSTOME. Small, tapering, length 0.15 mm. Dentition 3/3 then 4/4, with about 10 teeth per file, files not marked, rows of denticles transverse, lateral and median denticles not markedly different.

SCUTUM. Length 1.8 mm., width 1.2 mm.; impunctate, smooth, shining, hairless, castaneous; scapulae small and rounded. Cervical grooves faint and shallow, lateral carina absent, lateral groove present.

VENTRAL PLATES. Impunctate, hairless except for scattered short setae on median and posterior plates, castaneous. Median plate nearly as wide as long, length 0.9 mm. Adanal plate widest anteriorly. Epimeral plate contiguous with spiracular plate and mesally extending to the anterior margin of the spiracular plate. Anal plate rounded anteriorly, sides sub-parallel. Pregenital plate sub-pentagonal, postero-

lateral sides notched at mid length. Between the pregenital plate and coxae 1 on each side is a small oblique rectangular sclerite—the jugum or jugular plate.

LEGS. Coxae contiguous. Coxa 1 without external or internal posterior spur but with an anterior external gibbous process. Coxa 2 without spur, coxae 3 and 4 with small posterior external spurs. Trochanters with posterior gibbosity decreasing in strength on posterior coxae and absent on 4. Tarsus 1, 0.52 mm. long, tarsus 4 tapering gradually, 0.26 mm. long, metatarsus 4, 0.13 mm. long.

SPIRAGULAR PLATE. Sub-circular 0.22 mm. long, 0.17 mm. wide, macula central.

GENITAL APERTURE. Between coxae 3.

ANUS. Three pairs of setae.

The hitherto undescribed male of this species is described from a single male collected by R. A. Falla with one female and one nymph of *Ixodes auritulus* in the nest material of the common diving petrel (*Pelecanoides urinatrix*) on the Snares Islands, December 1947. The specimens are in the Dominion Museum, Wellington. Three male specimens were recovered by E. S. Gourlay from the faecal pellets of the tuatara (*Sphenodon punctatus*), a lizard which lives commensally in burrows on Stephen Island with the fairy prion (*Pachyptila turtur*), a bird which is known to be infested with *Ixodes auritulus* in that locality.

The coxal characters differ from those of the female but there is little doubt that this male is correctly associated with *Ixodes auritulus*. Except for the absence of the scutal grooves and the presence of spurs on the coxae, this male closely resembles that of *Ixodes canisuga* Johnst. var. *kerguelenensis* Andre and Colas-Belcour.

FEMALE. (Plate 2, figs. 1–4)

BODY. Up to 10 mm. long, 8 mm. wide.

CAPITULUM. Basis with straight posterior margin, cornua large, porose areas large, oblong; auriculae stout and retrograde, closer together than cornua. Palps with article 1 large, forming an anterior spur mesally, article 2 longer than 3 but separation indistinct.

HYPOSTOME. Dentition variable, 6/6 then 5/5 or 3/3 apically, then 4/4 and 3/3 at base.

SCUTUM. Sub-oval, longer than wide, 1.3 mm. long, 1.0 mm. wide.

VENTER. Anal grooves sub-parallel or slightly constricted posteriorly.

LEGS. Coxa 1 with short, broad, internal spur, smaller ones on 2 and 3. Coxae 1-4 with strong external spurs. Trochanters 1-4 with external spurs. Tarsi long and tapering with sub-apical humps very mild.

SPIRACULAR PLATE. Sub-circular, macula slightly eccentric.

NYMPH

Resembles female. Scutum 0.63 mm. long, 0.6 mm. wide. Dentition, 3/3 followed by 2/2, with 10 teeth in external file.

LARVA

Scutum 0.35 mm. long, 0.36 mm. wide. Dentition 2/2, with 10 teeth in external file.

The type specimens are in the Paris Museum and l'Ecole Veterinaire at Toulouse. The nymph collected by W. B. Benham 1907, on which the record of *I. unicavatus* Neumann (Nuttall 1916, p. 334) from the Antipodes Islands is based, belongs to *auritulus*. Through the co-operation of the British Museum I have been able to examine this specimen which is undoubtedly *I. auritulus*. The species is widely distributed on sea birds in both the Northern and Southern hemispheres but is also recorded from land birds in both North and South America.

Ixodes eudyptidis Maskell, 1885

Syn. *I. praecoxalis* Neumann 1899

I. intermedius Neumann 1899

I. neumanni Nuttall and Warburton 1911

The female and nymph were redescribed and figured by Nuttall and Warburton (1911, pp. 217-20) as a new species (*neumanni*) but this was later stated to be a synonym of *eudyptidis* by Nuttall (1916, pp. 320-1). The species is described by Fielding (1926, pp. 37-8) and by Taylor (1946, pp. 44-6), who reproduce Nuttall's figures. The larva is here described for the first time. The male is still unknown.

FEMALE. (Plate 3, figs.1-4)

BODY. Up to 8 mm. long, 5 mm. wide.

CAPITULUM. Basis with straight posterior border and parallel sides, cornua absent, porose areas pear-shaped, transverse, broader end internal. Well-marked blunt auriculae. Palps broad, outer margin straight, inner margin constricted between 2 and 3, 2 longer than 3.

HYPOSTOME. Dentition 4/4 in front to 2/2 behind, 10 teeth in external file.

SCUTUM. Longer than broad, 1.4 mm. long, 1.0 mm. wide, hexagonal.

VENTER. Anal grooves approaching each other behind anus.

LEGS. Coxa 1 with broad curved internal spur. Coxae 1-4 with postero-external spurs. Trochanters 1-4 with postero-external spurs strongest on 2 and 3, sometimes absent on 4 and more in nature of a gibbosity on 1. Tarsi tapering abruptly.

SPIRACULAR PLATES. Large, transversely oval.

NYMPH

Scutum longer than wide, about 0.6 mm. long, 0.5 mm. wide.

LARVA. (Plate 3, figs. 5-8)

BODY. Length 1.4 mm., width 1.1 mm., with prominent body setae as in the figure.

CAPITULUM. Palpal article 1 transverse, 2 and 3 not separated, combined length 0.13 mm.; wider and more expanded than in *anatis*, article 4 placed ventrally on apex of 3, sub-globose. Basis ventrally with four pairs of short sensory setae.

HYPOSTOME. Spatulate; length 0.13 mm., width 0.06 mm. Dentition 4/4 at tip then 3/3 and 2/2, about 8 or 9 teeth in outer file.

SCUTUM. Sub-triangular with rounded angles, wider than long, length 0.27 mm., width 0.32 mm., widest anteriorly at about $\frac{1}{4}$ length. A row of 6 setae across the disc between the lateral angles and 3 sensory pores or short setae in the neck angles.

LEGS. Coxae 1-3 with posterior external spurs, 1 and 2 with slight internal spurs. Coxal setae 2, 2, 2. Tarsus 1 tapering gradually, length 0.21 mm. Metatarsus 3, 0.07 mm. long; tarsus 3, 0.16 mm. long. Trochanters without spurs.

ANAL LOBES. One seta on each.

The type locality is Dusky Sound in the South Island where the type material was collected by A. Reischek (1885). Maskell's type material (2 females and 7 nymphs) is in the Canterbury Museum, as is one female co-type and a nymph determined by Nuttall. The species is recorded from outside New Zealand only from the southern coast of south-east Australia. It has not so far been recorded from south of New Zealand proper. It is closely related to *I. percavatus* Neum. which is recorded from a penguin (*E. minor*) on the west Australian coast. The species has occurred mainly on sea birds with two exceptions—a record from "wild duck" and one from the black shag in an inland locality. From this one shag, 40 female ticks, 8 nymphs, and 87 larvae, were collected.

A single female tick with fused porose areas was collected with specimens of typical *I. eudyptidis* from a little blue penguin (*Eudyptula minor*) at Nelson in 1939. The other characters are typical of *eudyptidis* and the second palpal article is slightly longer than the third. The second palpal joint in *I. unicavatus* is half the length of the third. The specimen was compared with the type of *unicavatus* by Professor Brizard of Toulouse who confirmed my opinion that the Nelson specimen was not *unicavatus*. It was next considered whether the specimen represented a new species and, in particular, whether it was identical with three specimens collected by J. E. Harting from a cormorant in an unstated locality (Nuttall and Warburton, 1911, p. 266). These unicavate specimens were stated to have the same palpal proportions as the Nelson specimen. They had been previously identified as *eudyptidis* by Neumann, but Nuttall and Warburton relegated them to *unicavatus* in spite of the discrepancy in the palpal proportions. I have been able to examine these specimens through the kindness of the British Museum and I find that they are correctly referred to *unicavatus*, the apparent anomaly being due to the difficulty of distinguishing the line of articulation between the second and third palpal joints. The Nelson specimen is therefore unique, and as it has the general facies of *eudyptidis* is best considered as an aberration of that species.

Ixodes ricinus (Linnaeus, 1746 and 1758)

This species is described and figured by Nuttall and Warburton (1911, pp. 143-56).

MALE. (Plate 3, fig. 12)

BODY. Length 2.45 mm., width 1.33 mm.

CAPITULUM. Palpal article 3 slightly longer than 2.

HYPOSTOME. Six to 8 marginal teeth increasing in strength and connected by crenulations, 2 large basal teeth directed ventrally.

SCUTUM. Length 1.8 mm., width 1.1 mm., with numerous fairly long scattered hairs.

VENTRAL PLATES. Pregenital plate nearly twice as long as broad, median plate fairly broad with rounded sides, anal plate with lateral borders diverging, adanal plates narrowing posteriorly.

LEGS. Coxa 1 with long internal spine overlapping coxa 2 and slight external tooth, external teeth on coxae 2-4; tarsi long, tapering gradually.

SPIRACULAR PLATE. Large, oval, long axis directed forward, macula anterior.

FEMALE. (Plate 3, figs. 9–11)

BODY. May reach 11 mm. long, 7 mm. wide.

CAPITULUM. Cornua absent, slight auricular ridges. Porose areas pyriform, broader end internal, situated near posterior border. Palps with article 2 nearly twice as long as broad, 3 shorter than 2.

HYPOSTOME. Dentition 3/3, about 10 teeth per file.

SCUTUM. Sub-pentagonal with rounded angles, average length 1.38 mm., width 1.25 mm.

VENTER. Anal grooves rounded in front, parallel behind anus.

LEGS. Coxae as in male; tarsi long, tapering gradually.

SPIRACULAR PLATE. Circular.

NYMPH

Like female, but internal spine on coxa 1 shorter. Dentition 3/3 then 2/2. Scutum 0.62 mm. long, 0.59 mm. wide (average).

LARVA

Like nymph, but internal spur on coxa 1 shorter; dentition 3/3 then 2/2. Average length of scutum 0.33 mm., width 0.37 mm.

This is the common sheep tick of Great Britain. It is also present in Europe, Asia, and Africa, but is not present in the Southern Hemisphere. It was recorded in New Zealand by Miller (1922), but it has never been taken since then and is doubtfully established in New Zealand. A male and a female (not from New Zealand) determined by Nuttall are in the Cawthron collection.

Ixodes uriae White, 1852

Syn. *Hyalomma puta* Picard-Cambridge 1878

All stages of this species, except the larva, are described and figured (as *I. putus*) by Nuttall and Warburton (1911, pp. 256–61). The larva is described and figured by Nuttall (1912, p. 60). The species is described and figured by Cooley and Kohls (1945, pp. 223–6), Fielding (1926, pp. 33–7), and Taylor and Murray (1946, pp. 60–3), who reproduce Nuttall's figures.

MALE. (Plate 2, figs. 13, 14)

BODY. Length up to 3.7 mm.; narrow in front, sides diverging for one-third, then sub-parallel. Posteriorly with five lobes, each bearing a brush of long hairs.

CAPITULUM. Palps horn-like and curved upward distally, article 4 projects ventrally from base of 3.

HYPOSTOME. Short, bifid, faint indications of 6 teeth, dentition 1/1, 3 teeth per file.

VENTRAL PLATES. Pregenital plate semi-lunar; median plate elongate, rather narrow; anal plate rounded in front, sides diverging posteriorly; adanal plates with very convex border.

LEGS. All coxae and trochanters unarmed.

FEMALE. (Plate 2, figs. 10-12)

BODY. When gorged may reach 11 mm. long by 7 mm. wide, thickly covered with white hairs.

CAPITULUM. Basis without cornua or auriculae. Porose areas oval or semi-lunar, interval very narrow. Palps with article 2 longer than 3 but separation indistinct, 3 broader than 2 giving a clavate appearance, 4 often visible above.

HYPOSTOME. Dentition 2/2, with 8 teeth per file.

SCUTUM. Longer than wide, 1.2-1.6 mm. long, 1.1-1.2 mm. wide, broadest near anterior end.

VENTER. Anal grooves slightly divergent.

LEGS. Coxae and trochanters unarmed. Tarsi distinctly humped and tapering abruptly.

SPIRACULAR PLATE. Sub-oval, transverse.

NYMPH

Resembles female. Scutum longer than wide, widest anteriorly, 0.8 mm. long, 0.7 mm. wide.

LARVA

Resembles nymph. Scutum narrow, 0.4 mm. long.

EGG

Length 0.6 mm.; golden yellow, blunt oval.

This species is widely distributed on birds in the Antarctic, North and South America, Europe, and Asia. *Ixodes maskelli* Kirk (1887) may have been this species, but the type is lost and the description inadequate. Males and females are in the Canterbury Museum in the Cape Expedition material.

Haemaphysalis bispinosa Neumann, 1897

All stages of this species are described and figured by Nuttall and Warburton (1915, pp. 426-33), Fielding (1926, pp. 60-2), and Taylor and Murray (1946, pp. 74-7), who reproduce Nuttall's figures.

MALE

CAPITULUM. With basis long and broadly rectangular, the sides straight and parallel or converging posteriorly, and with stout cornua. Palps with articles 2 and 3 sub-equal, no spines on 2, a sharp retrograde spine on both dorsal and ventral posterior borders of 3.

HYPOSTOME. Dentition 4/4 to 6/6.

SCUTUM. 1.45 to 2.3 mm. long, 1 to 1.65 mm. wide; long, oval, uniformly punctate.

VENTER. Anal groove semicircular, behind anus, ano-marginal groove present. Eleven festoons present, very long.

LEGS. Coxa 1 with moderately sharp spur, spurs less well developed on 2-4.

SPIRACULAR PLATE. Sub-oval, broadest posteriorly.

FEMALE. (Plate 4, figs. 1, 2)

CAPITULUM. With short blunt cornua, porose areas fairly large, oval, far apart. Palps as in male.

HYPOSTOME. Dentition 4/4 to 6/6.

SCUTUM. Nearly circular, 0.8 mm. to 1.2 mm. diameter, regularly punctate.

LEGS. As in male. Tarsi tapering.

SPIRACULAR PLATE. Nearly circular.

NYMPH

BODY. Elongate.

CAPITULUM. Dorsal spine lacking on article 3 of palps, ventral spine present.

HYPOSTOME. Dentition 3/3.

SCUTUM. Sub-circular, 0.2 mm. diameter.

LEGS. As in female.

SPIRACULAR PLATE. Nearly circular.

LARVA

BODY. Length 0.53 mm., width 0.44 mm.

CAPITULUM. Cornua absent.

HYPOSTOME. Dentition 2/2.

SCUTUM. Broader than long, length 0.25 mm., width 0.33 mm.

LEGS. Coxa 1 with blunt internal spur, coxae 2 and 3 not armed.

EGG

Ovoid, length 0.58 mm., width 0.40 mm.

This introduced species became established in North Auckland in 1910, and now occurs throughout the northern half of the North Island as far south as Hastings and Foxton. It is the only species of any economic importance in New Zealand. Elsewhere it occurs from Japan to Africa and Australia, on oxen, horses, etc.

Haemaphysalis leachi (Audouin, 1827)

All stages of this species are described and figured by Nuttall and Warburton (1915, pp. 460-6), Fielding (1926, pp. 56-8), and Taylor and Murray (1946, pp. 77-9), who reproduce Nuttall's figures.

MALE

BODY. Very variable in size.

CAPITULUM. Base with strong cornua, lateral borders straight, converging posteriorly, line of lateral margins of palps meeting anteriorly in a very obtuse angle. Palps broadly conical, article 2 very salient laterally, with a dorsal and a ventral retrograde spur from the lateral salience, article 3 with no dorsal spur but a strong retrograde ventral spur.

HYPOSTOME. Dentition 5/5 or 4/4, with 10 to 12 teeth per file.

SCUTUM. Long and narrow, average length 2.6 mm., width 1.3 mm., with many minute punctations.

VENTER. Fестоons as broad as long, anal grooves ogival.

LEGS. Coxa 1 with blunt internal spur, 2 with small posterior spur at mid length, 3 with larger spur more internal, 4 with internal spur. Dorsal spur on trochanter 1 strong and pointed.

SPIRACULAR PLATE. Oval.

FEMALE. (Plate 4, figs. 3-5)

CAPITULUM. Strong cornua, porose areas oval, far apart. Palps resemble those of male but are longer and meet at less obtuse angle.

HYPOSTOME. Dentition 5/5, at times 6/6, rarely 4/4.

SCUTUM. Long, oval, 1.2 mm. long, 0.8 mm. wide on average.

LEGS. Coxae only slightly armed with spurs as in male; tarsi tapering.

SPIRACULAR PLATE. Sub-circular.

NYMPH

BODY. Unfed, 1.5 mm. long, 1.0 mm. wide; gorged 3.4 mm. by 2.0 mm.

CAPITULUM. Cornua small and palpal processes slight.

HYPOSTOME. Dentition 2/2, with 6 or 7 teeth per file.

SCUTUM. Pentagonal, as wide as long, 0.5 mm.

LEGS. As in female.

SPIRACULAR PLATE. Small transverse, bluntly comma-shaped.

LARVA

BODY. Unfed, 0.5 mm. long, 0.4 mm. wide; gorged 1.5 mm. long, 0.9 mm. wide.

SCUTUM. Broader than long.

LEGS. Coxae not armed.

This species was originally recorded by Mason (1921) but has not been collected since then, and is doubtfully established in New Zealand. It occurs from India to Africa and Australia on oxen, horses, etc.

A male and a female (not from New Zealand) are in the Cawthron collection.

Hyalomma aegyptium (Linnaeus, 1758)

The species is figured and described by Fielding (1926, pp. 74-7) and Taylor and Murray (1946, pp. 39 and 94-7), the latter including figures by Nuttall and Neumann.

MALE

BODY. Oval, flat, 6-7 mm. long, 3.5-5 mm. wide excluding capitulum. With stout scattered hairs.

CAPITULUM AND HYPOSTOME. As in female.

VENTER. Eleven marginal festoons, median one triangular. Adanal shields brown, elongated, extending to level of spiracles. Behind adanal shields two conical chitinized processes projecting posteriorly. Epimeral shield chitinized posteriorly only between adanal and spiracle.

LEGS. Coxa 1 bifid, with 2 large spines. Tuberosity at posterior angle of 4. Tarsi gradually attenuated, tarsi 2-4 with 2 short spines on dorsal border near extremity.

SPIRACULAR PLATE. Comma-shaped.

FEMALE. (Plate 4, figs. 8, 9)

BODY. Oval, broader posteriorly. Unfed, 7 mm. long, 3.5 mm. wide; gorged, 20 mm. long (including capitulum), 18 mm. wide.

CAPITULUM. Porose areas slightly elongated, shallow. Palps long and narrow, 2 and 3 equal, 4 very short and inserted ventrally on 3.

HYPOSTOME. Slightly spatulate. Dentition 3/3, with 10 to 12 teeth.

SCUTUM. Hexagonal oval slightly broader than long. Eyes black, hemispherical, about mid length of scutum and distant from lateral angle.

VENTER. Eleven festoons.

SPIRACULAR PLATE. Large, sub-triangular, almost as broad as long.

NYMPH

Scutum similar to that of female, spiracles small, almost circular.

This species was originally recorded from a huia skin from New Zealand by Mason (1921) but it has not been collected since then, and is doubtfully established in New Zealand. Elsewhere the species occurs from Spain to Africa and Asia, and it is recorded in Australia. A male and a female (not from New Zealand), determined by Nuttall, are in the Cawthron collection.

Aponomma sphenodonti Dumbleton, 1943

MALE

BODY. Sub-circular, length 2.5 mm., width 2.0 mm.

CAPITULUM. Palps with article 2 longer than 3, 4 terminal longer than wide.

HYPOSTOME. Dentition 2/2, with about 8 teeth per file.

VENTER. Anal groove semicircular, contouring anus behind, anal lobes with 5 pairs of setae. Festoons present on posterior margin between spiracles.

LEGS. All coxae with posterior external spur, trochanters without spurs, tarsi very slightly humped.

SPIRACULAR PLATE. Ovoid, 0.04 mm. long, 0.03 mm. wide, long axis longitudinal, macula eccentric.

FEMALE. (Plate 4, figs. 6, 7)

BODY. Sub-circular, length 2.5 mm., width 1.7 mm.

CAPITULUM. Porose areas small, sub-circular. Palps with article 2 longer than 3, article 4 terminal, longer than wide.

HYPOSTOME. Dentition 2/2, with 5 or 6 teeth per file.

SCUTUM. Sub-cordiform, wider than long, length 1.2 mm., width 0.9 mm.

VENTER. Anal groove semicircular behind anus, with short ano-marginal groove. Anal lobes with 5 setae on each. Eleven festoons posteriorly.

LEGS. Coxae 1-4 with postero-external spurs and 2 or 3 short setae, tarsi tapered or only slightly humped.

SPIRACULAR PLATE. Sub-circular, length 0.23 mm., macula slightly eccentric.

NYMPH

BODY. Sub-circular, length 1.5-2.6 mm., width 1.17-2.1 mm.

HYPOSTOME. Dentition 2/2.

SCUTUM. Transverse, 0.54 mm. long, 0.87 mm. wide.

VENTER. Anus with 3 pairs of setae. Festoons present.

LEGS. As in female.

LARVA

BODY. Sub-circular, length 1.4 mm., width 1.1 mm.

HYPOSTOME. Dentition 2/2, about 4 teeth per file.

SCUTUM. Sub-cordiform, transverse, length 0.34 mm., width 0.45 mm.

VENTER. Anal lobes without setae, festoons not evident. Contouring anus behind is a semicircular line of minute setae.

LEGS. As in female and nymph.

The type locality is Stephen Island off the northern coast of the South Island of New Zealand. The holotype male is in the Cawthron collection and the allotype female is in the collection of Mr. E. S. Gourlay.

KEYS TO THE STAGES, GENERA, AND SPECIES OF IXODIDAE RECORDED FROM THE NEW ZEALAND SUB-REGION

Key to Tick Stages

- | | | | | | | | |
|-----|---|---|---|---|---|---|--------------|
| (1) | 3 pairs of legs | - | - | - | - | - | larva |
| | 4 pairs of legs | - | - | - | - | - | (2) |
| (2) | Scutum covering whole body, porose areas on capitulum absent | - | - | - | - | - | adult male |
| | Scutum covering only part of body, porose areas absent or present | - | - | - | - | - | (3) |
| (3) | Porose areas absent, genital aperture absent | - | - | - | - | - | nymph |
| | Porose areas present, genital aperture present | - | - | - | - | - | adult female |

Key to the Genera of Ixodidae (♂ ♂ and ♀ ♀)

- (1) Eyes present - - - *Hyalomma* C. L. Koch 1884
 Eyes absent - - - (2)
- (2) Festoons* absent, anal grooves
 contouring the anus in front *Ixodes* Latreille 1795
 Festoons present, anal grooves
 contouring the anus behind (3)
- (3) Second segment of palp pro-
 duced laterally to form an
 acute angle, capitulum short *Haemaphysalis* C. L. Koch 1884
 Second segment of palp not
 produced laterally, capitulum
 long - - - *Aponomma* Neumann 1899

*Best seen in unfed females.

Key to Males of Genus *Ixodes*

- (1) Body with five posterior brushes of hairs.
 Coxae not armed with spurs. Palpal
 joint 3, pointed and upturned - - *uriae* White
 Body without posterior hair brushes. Some
 or all coxae with spurs. Palpal joint 3,
 rounded, not upturned - - - (2)
 - (2) Hypostome with teeth varying greatly in
 size, 6-8 marginal teeth with 2 basal
 teeth directed ventrally. Coxa 1 with
 internal spur long and overlapping
 coxa 2 - - - *ricinus* Linnaeus
 Hypostome without great difference in
 size of teeth. Internal spur on coxa 1,
 if present, not as above - - - (3)
 - (3) Median plate nearly as wide as long,
 pregenital plate sub-pentagonal, two
 small jugular plates present. Dentition
 3/3 then 4/4, 10 in a file - - *auritulus* Neumann
 Median plate longer than wide; pregenital
 plate transverse, concave anteriorly; no
 jugular plates; dentition rudimentary,
 2/2 or 3/3 then 1/1, 6 teeth in outer
 file - - - *anatis* Chilton
- N.B.—The male of *eudyptidis* is not known.

Key to Females of Genus *Ixodes*

- (1) Anterior mesal margin of first segment of
 palp projecting cephalad as an anterior
 spur - - - *auritulus* Neumann
 First segment of palp not as above - (2)
- (2) Anal grooves convergent behind, scutum
 as broad as or broader than long - *anatis* Chilton
 Anal grooves sub-parallel or divergent,
 scutum longer than broad - - - (3)

Key to Females of Genus *Ixodes*—continued

- (3) Coxae not armed - - - - *uriae* White
- Some coxae with spurs - - - - (4)
- (4) Inner end of coxa 1 much prolonged - *ricinus* Linnaeus
- Inner end of coxa 1 not prolonged - (5)
- (5) Second segment of palp longer than third,
porose areas on capitulum pear-shaped
and separated - - - - *eudyptidis* Maskell

Key to Nymphs of the Genus *Ixodes*

- (1) Coxae and trochanters not armed - - *uriae* White
- Not so - - - - (2)
- (2) Cornua and auriculae strongly developed,
anterior mesal angle of palpal article 1
produced; scutum very slightly longer
than wide; spurs on all coxae and
trochanters; dentition 3/3, with 10 teeth
per file - - - - *auritulus* Neumann
- Not so - - - - (3)
- (3) Scutum wider than long, sub-pentagonal;
outer spur on coxa 1 only; dentition
2/2 with 10 teeth per file - - *anatis* Chilton
- Not so - - - - (4)
- (4) Internal spur on coxa 1 produced over
coxa 2 - - - - *ricinus* Linnaeus
- Not so - - - - *eudyptidis* Maskell

Key to Larvae of Genus *Ixodes*

- (1) Coxae not armed, scutum longer than
wide - - - - *uriae* White
- Some or all coxae armed with spurs,
scutum as wide as or wider than long (2)
- (2) Cornua and auriculae strongly developed,
anterior mesal angle of palpal article 1
produced - - - - *auritulus* Neumann
- Not as above - - - - (3)
- (3) Prominent inner spur on coxa 1, external
spurs on coxae 1 and 2 only. Scutum
widest at mid length - - - - *ricinus* Linnaeus
- No inner spur on coxa 1, external spurs
on coxae 1-3, scutum widest before mid
length - - - - (4)
- (4) Dentition 2/2, coxal setae 3, 2, 2 or 3, 3, 2.
Four setae across anterior margin of
scutum behind neck - - - - *anatis* Chilton
- Dentition 4/4 at tip, 3/3 and 2/2
posteriorly. Scutal setae not on anterior
margin. Coxal setae 2, 1, 1; internal
angles of coxae 1 and 2 trenchant - *eudyptidis* Maskell

Key to Genus *Haemaphysalis* (♂ ♂ and ♀ ♀)

Third segment of palp with erect dorsal spur,
scutum as wide as long - - - *bispinosa* Neumann
Third segment of palp without erect dorsal
spur, scutum longer than wide - - - *leachi* Audouin

Genus *Hyalomma* (♂ ♂ and ♀ ♀)

A single species. Coxa 1 bifid - - - *aegyptium* Linnaeus

Genus *Aponomma* (♂ ♂ and ♀ ♀)

A single species. Dentition 2/2 - - - *sphenodonti* Dumbleton

HOST LIST OF IXODIDAE FROM THE
NEW ZEALAND SUB-REGION

Identifications are by the author unless otherwise stated. The locations of the specimens are indicated by the following abbreviations:

B.M., British Museum; C.E., Cape Expedition material from Subantarctic, deposited in Canterbury Museum; C.I., Cawthron Institute; C.M., Canterbury Museum; D.M., Dominion Museum; E.S., Entomological Research Station; V.U., Victoria University College.

Discrepancies between this and previous lists are mainly due to changes in the nomenclature of the hosts.

The record of *Ixodes unicavatus* has been deleted since it was based on a misidentification.

Ixodes anatis Chilton

AVES

Apterygiformes

Apteryx mantelli, North Island kiwi.

North Island, coll. W. W. Smith, -/3/14, det. Nuttall (1916, p. 220). B.M.

Aponga, North Auckland, coll. (?) J. G. Myers, 18/7/21. C.I.

Tangihua Ra., North Auckland, coll. E. Rye, 1949. E.S.

Orowhana Ra., North Auckland, coll. H. S. Whitehorn, 1/9/23. C.I.

Anseriformes

Anas superciliosa, grey duck.

Ashburton, coll. W. W. Smith, -/3/03. Type C.M.

Branta canadensis, Canada goose.

New Plymouth, coll. W. W. Smith, 1927, det. Nuttall. B.M. and C.I.

Ixodes auritulus Neumann

AVES

Sphenisciformes

Aptenodytes patagonica, king penguin.

Macquarie Is., coll. H. Hamilton, 14/12/12, det. Nuttall (1916, p. 315).

Procellariiformes

Diomedea exulans, wandering albatross.

Antipodes Is., coll. W. B. Benham, 1907. B.M.

Pachyptila turtur, fairy prion.

Stephen Is., coll. E. S. Gourlay, 1933. E.S.

Pachyptila crassirostris, large-billed fairy prion.

Auckland Is. (Ocean Is.), 5/1/45. C.E.

Pelecanoides urinatrix, diving petrel.

Snares Is. (from nest material), coll. R. A. Falla, Dec. 1947. D.M.

Auckland Is. (Erebus Cove), coll. R. W. Balham, 5/12/43. C.E.

Auckland Is. (Ocean Is.), coll. W. H. Dawbin, 22/1/43. C.E.

Puffinus griseus, sooty shearwater.

Subantarctic, no locality, coll. R. A. Falla. C.E.

Charadriiformes

Catharacta lonnbergi, southern skua.

Macquarie Is., coll. H. Hamilton, det. Nuttall (1916, p. 315).

Ixodes eudyptidis Maskell

AVES

Sphenisciformes

Eudyptes pachyrhynchus, crested penguin.

Dusky Sound, coll. A. Reischek (17). Type C.M.

Eudyptula minor, little blue penguin.

Wellington, 24/11/33. D.M.

Nelson, coll. L. J. Dumbleton, 1939. E.S.

Tolaga Bay, coll. J. D. Anderson, 15/1/34. C.I.

Eudyptula albosignata, white-flipped penguin.

Lyttelton Harbour, coll. E. Percival, Dec. 1938. E.S.

Procellariiformes

Pterodroma cooki, Cook's petrel.

N.Z., coll. Schauinsland, det. Neumann (as *praecoxalis*) (Nuttall and Warburton, 1911, p. 220).

Pelecaniformes

Phalacrocorax carbo, black shag.

Pareora Gorge, coll. M. Kershaw, Oct. 1950.

Phalacrocorax sp., cormorant.

N.Z., coll. Schauinsland, det. Neumann (as *intermedius*) (Nuttall and Warburton, 1911, p. 220).

Anseriformes

"Wild Duck."

Waikouaiti. C.I.

Charadriiformes

Chlidonias albigriata, black-fronted tern.

New Plymouth, coll. W. W. Smith, 22/11/09, det. Nuttall (1916, p. 327).

Larus novae-hollandiae, red-billed gull.

Wellington, coll. W. Williams, 2/12/38. D.M.

Seatoun, 12/11/36. D.M.

Ixodes eudyptidis Maskell—continued

AVES—continued

Unclassified

“Penguin.” Gisborne, 18/1/34. E.S.

“Small sea bird.”

Wairau Bar, coll. E. C. Perano, 27/11/38. E.S.

“Sea bird.”

New Plymouth, 20/1/28. E.S.

“Pigeon gull.”

French Pass, Dec. 1939. E.S.

Ixodes ricinus Linnaeus

MAMMALIA

Equus caballus, horse.

Wanganui, 1919, det. D. Miller (1922).

Ixodes uriae White

AVES

Sphenisciformes

Aptenodytes patagonica, king penguin.

Macquarie Is., coll. H. Hamilton, 21/1/12, det. Nuttall (Nuttall and Warburton, 1911, p. 330).

Eudyptes cristatus, rockhopper penguin.

Macquarie Is., coll. H. Hamilton, 15/2/12, det. Nuttall (Nuttall and Warburton, 1911, p. 330).

Campbell Is., coll. J. H. Sorensen, 1/2/47. C.E.

Auckland Is. (Port Ross), coll. E. G. Turbott, 20/2/44. C.E.

Eudyptes pachyrhynchus, crested penguin.

Kapiti Is., coll. Wilkinson, 4/9/32. D.M.

Eudyptes schlegeli, royal penguin.

Macquarie Is., coll. H. Hamilton, 8/2/12, det. Nuttall (Nuttall and Warburton, 1911, p. 330).

Eudyptes sclateri, big-crested penguin.

Campbell Is., coll. J. H. Sorensen, 29/10/47. C.E.

Megadyptes (?) *antipodes*, yellow-eyed penguin.

No locality. C.E.

Procellariiformes

Diomedea epomophora, royal albatross.

Campbell Is., coll. J. H. Sorensen, 1943. C.E.

Campbell Is., coll. A.S. Duthie, 1943. C.E.

Diomedea exulans, wandering albatross.

Antipodes Is., coll. W. B. Benham, 1907, det. Nuttall (Nuttall and Warburton, 1911, p. 330, B.M.).

Phoebastria palpebrata, light-mantled sooty albatross.

Macquarie Is., coll. H. Hamilton, 5/11/12, det. Nuttall (Nuttall and Warburton, 1911, p. 331).

Campbell Is., coll. J. H. Sorensen, 1943. C.E.

Charadriiformes

Catharacta lonnbergi, southern skua.

Campbell Is., coll. J. H. Sorensen, 1942. C.E.

Thalassarche cauta, white-capped mollymawk.

Auckland Is., coll. R. A. Falla, 1942. C.E.

Auckland Is. (Disappointment Is.), coll. E. G. Turbott, 9/12/44. C.E.

Cape Campbell, coll. C. Lindsay, 23/3/32. D.M.

Ixodes uriae White—continued

AVES—continued

Charadriiformes—continued

- Thalassarche chrysostoma*, grey-headed mollymawk.
Campbell Is., coll. J. H. Sorensen, 1943. C.E.
Thalassarche melanophrys, black-browed mollymawk.
Campbell Is., coll. J. H. Sorensen, 1943. C.E.
Auckland Is., 20/4/44. C.E.

Pelecaniformes

- Phalacrocorax colensoi*, Auckland Island shag.
Auckland Is., coll. R. A. Falla, 10/8/43. C.E.
Phalacrocorax purpureus, Macquarie Island shag.
Macquarie Is., det. Hirst (1916).

Haemaphysalis bispinosa Neumann

The following records are from Myers (1924).

MAMMALIA

- | | |
|--------------------------------|--|
| <i>Bos taurus</i> , cattle. | <i>Homo sapiens</i> , man. |
| <i>Canis familiaris</i> , dog. | <i>Lepus europaeus</i> , hare. |
| <i>Capra hircus</i> , goat. | <i>Oryctolagus cuniculus</i> , rabbit. |
| <i>Equus caballus</i> , horse. | <i>Ovis aries</i> , sheep. |
| <i>Felis domesticus</i> , cat. | <i>Sus scrofa</i> , pig. |

AVES

- | | |
|--------------------------------------|--|
| <i>Alauda arvensis</i> , skylark. | <i>Passer domesticus</i> , house |
| <i>Anas platyrhynchos</i> , duck. | sparrow. |
| <i>Gallus gallus</i> , fowl. | <i>Phasianus colchicus</i> , pheasant. |
| <i>Meleagris gallipavo</i> , turkey. | <i>Turdus ericetorum</i> , thrush. |

Haemaphysalis leachi Audouin

AVES

- Heteralocha acutirostris*, huia.
New Zealand, from skin, Mason (1921).

Hyalomma aegyptium Linnaeus

AVES

- Heteralocha acutirostris*, huia.
New Zealand, from skin, Mason (1921).

Aponomma sphenodonti Dumbleton

REPTILIA

- Sphenodon punctatus*, tuatara.
Stephen Is., coll. H.B. Kirk, 1907. V.U.
Stephen Is., coll. R. J. Tillyard, 1922. Type C.I.
Stephen Is., coll. 27/8/24. D.M.
Stephen Is., coll. E. S. Gourlay, 1933. C.I.

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Key to Abbreviations

A -	- Auricula.	HB	- Hair brush of male.
AAP	- Adanal plate.	IS -	- Internal spur on coxa.
AG	- Anal groove.	J -	- Jugum.
AP	- Anal plate.	LA	- Lateral angle of 2nd palpal joint.
AS	- Anterior spur of 1st palpal joint.	MBF	- Marginal body-fold of male.
BC	- Basis capituli.	MP	- Median plate of male.
C -	- Coruna.	Pl, 2, 3, 4 -	- Palpal joints.
DS	- Dorsal spur of 2nd palpal joint.	PA	- Porose area on basis capituli.
E -	- Eye.	PGP	- Pregenital plate of male.
EP	- Epimeral plate of male.	S -	- Scutum.
ES	- External spur of coxa.	SP	- Spiracular plate.
F -	- Fестоons.	I -	- Anterior coxa.
GA	- Genital aperture.	IV	- Posterior coxa.
GG	- Genital groove.		

PLATE 1

Ixodes anatis

- Fig. 1. ♀ capitulum and scutum, dorsal.
 2. ♀ capitulum, ventral.
 3. ♀ coxae and trochanters, ventral.
 4. ♀ anus and anal groove, ventral.
 5. ♂ dorsal.
 6. ♂ ventral.
 7. ♂ coxae, trochanters and jugum.
 8. ♂ hypostome, ventral.
 9. ♂ tarsus 1 and tarsus 4, lateral.
 10. larva, scutum, dorsal.
 11. larva, coxae, ventral.
 12. larva, tarsus 1, lateral.
 13. larva, hypostome, ventral.

PLATE 1

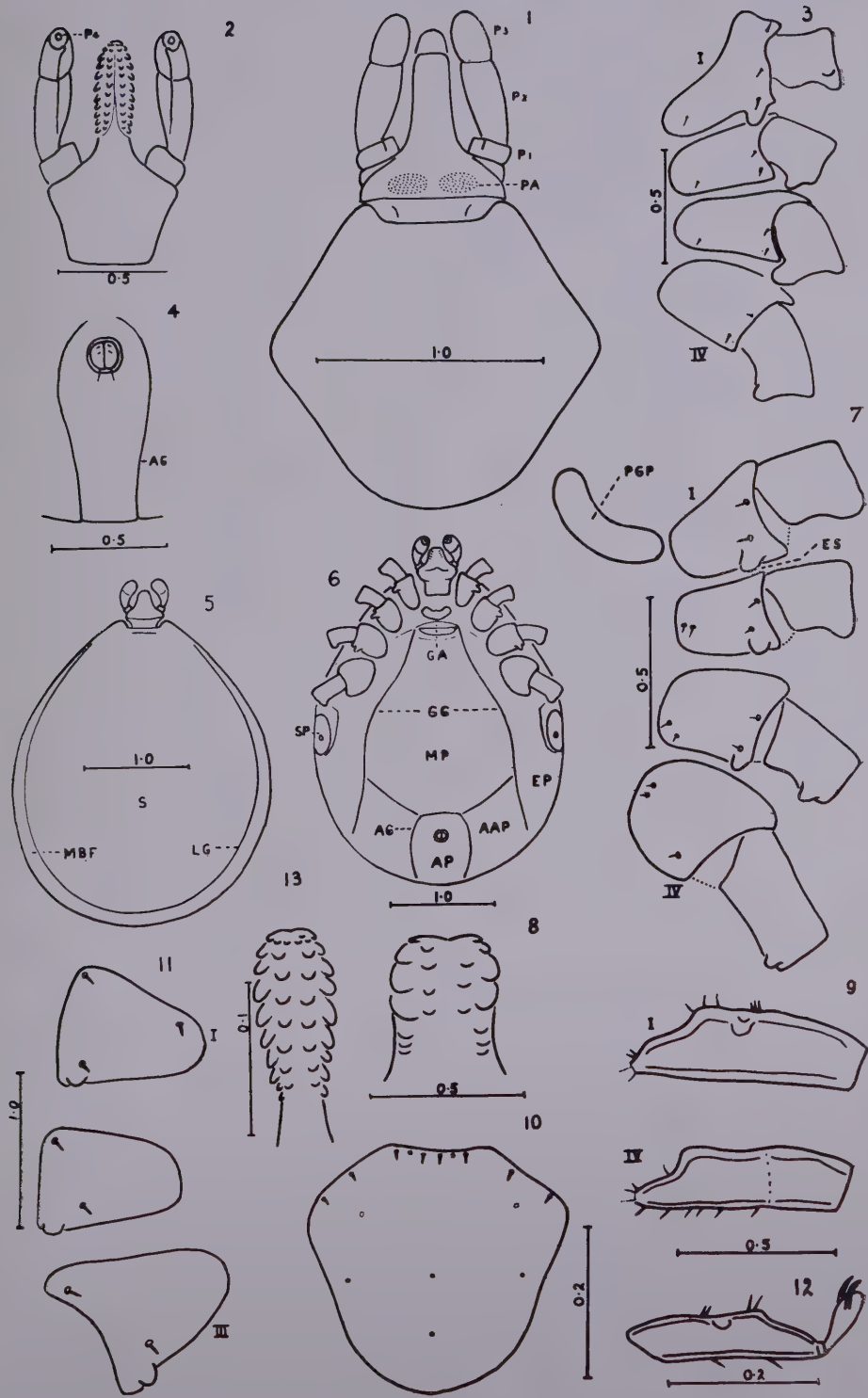


PLATE 2

Ixodes auritulus

- Fig. 1. ♀ capitulum and scutum, dorsal.
2. ♀ capitulum, ventral.
3. ♀ coxae and trochanters, ventral.
4. ♀ anus and anal groove, ventral.
5. ♂ dorsal.
6. ♂ ventral.
7. ♂ coxae, trochanters, pregenital plate and jugum.
8. ♂ tarsus 1 and tarsus 4, lateral.
9. ♂ hypostome, ventral.

Ixodes uriae

- Fig. 10. ♀ capitulum and scutum, dorsal.
11. ♀ capitulum, ventral.
12. ♀ coxae and trochanters, ventral.
13. ♂ ventral.
14. ♂ hypostome, ventral.

PLATE 2



PLATE 3

Ixodes eudyptidis

- Fig. 1. ♀ capitulum and scutum, dorsal.
2. ♀ capitulum, ventral.
3. ♀ coxae and trochanters, ventral.
4. ♀ anus and anal groove, ventral.
5. larva, dorsal.
6. larva, ventral.
7. larva, coxae.
8. larva, hypostome, ventral.

Ixodes ricinus

- Fig. 9. ♀ capitulum and scutum, dorsal.
10. ♀ capitulum, ventral.
11. ♀ coxae and trochanters, ventral.
12. ♂ hypostome, ventral.

PLATE 3

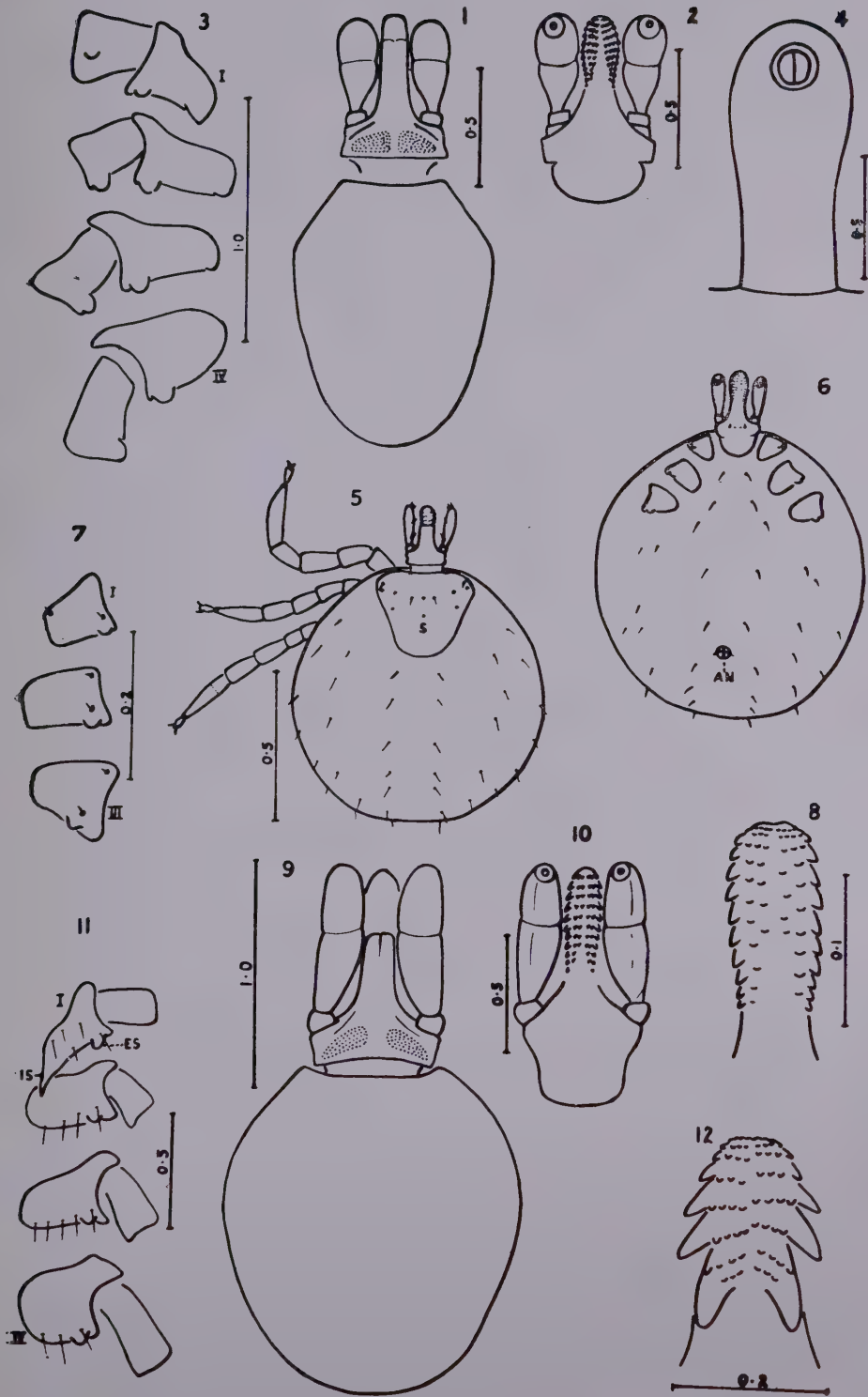


PLATE 4

Haemaphysalis bispinosa

- Fig. 1. ♀ capitulum and scutum, dorsal.
2. ♀ coxae and trochanters, ventral.

Haemaphysalis leachi

- Fig. 3. ♀ scutum and capitulum, dorsal.
4. ♀ coxae and trochanters, ventral.
5. ♀ anal groove and festoons, ventral.

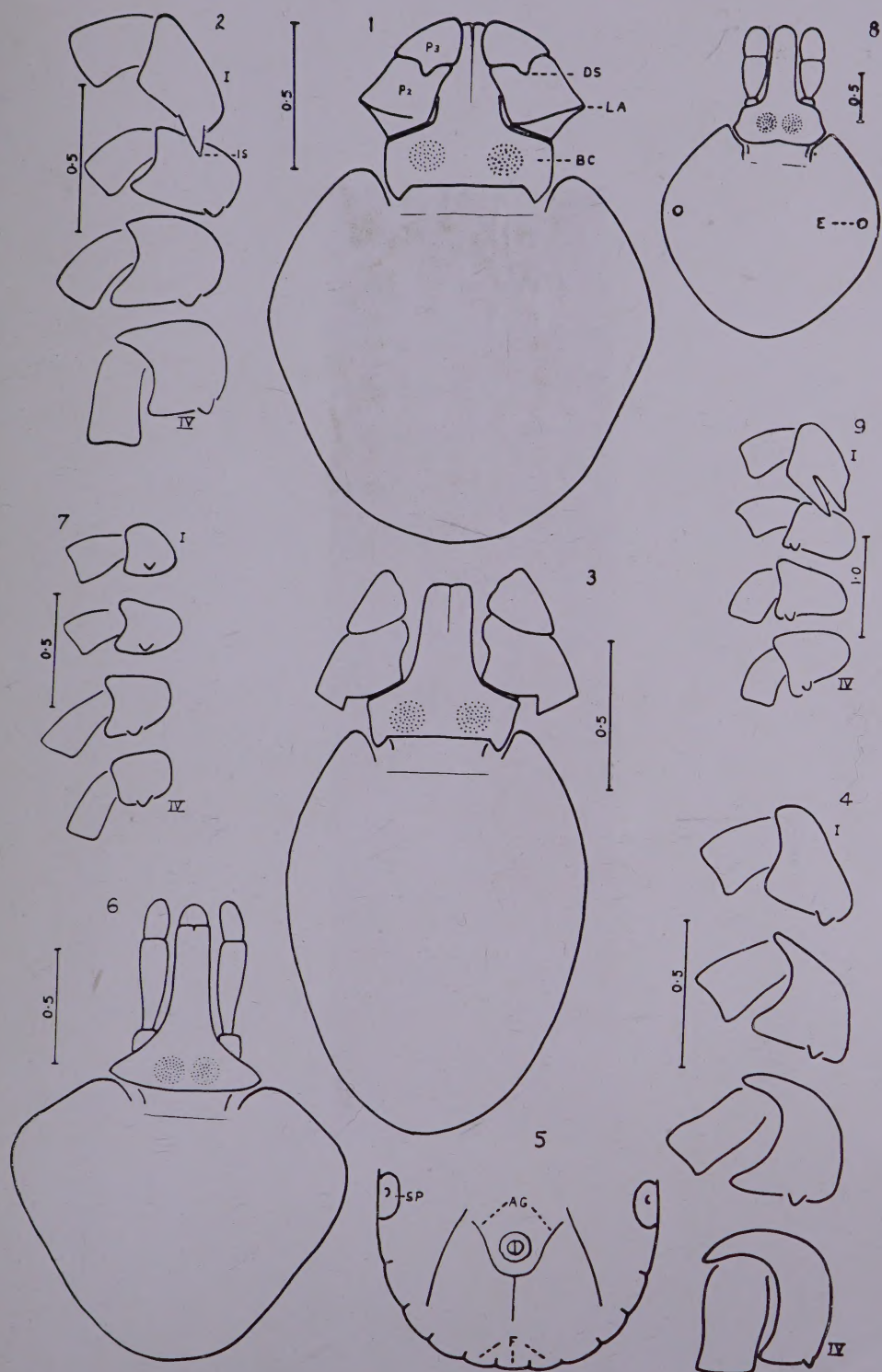
Aponomma sphenodonti

- Fig. 6. ♀ capitulum and scutum, dorsal.
7. ♀ coxae and trochanters, ventral.

Hyalomma aegyptium

- Fig. 8. ♀ capitulum and scutum, dorsal.
9. ♀ coxae and trochanters, ventral.

PLATE 4



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